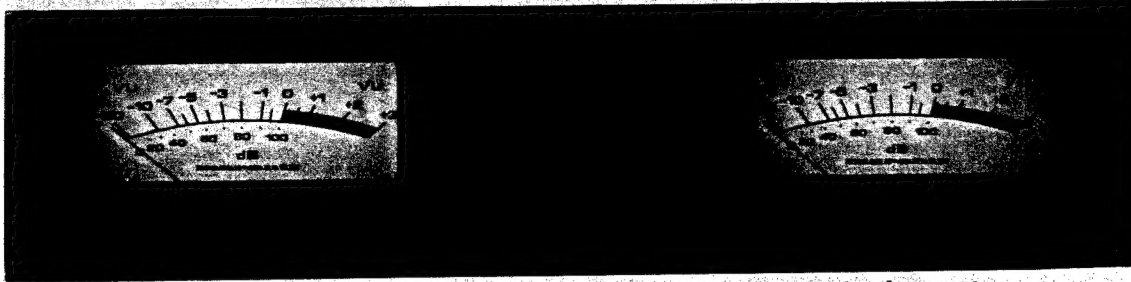


80

marantz



meter range

0dB. +10dB
OFF. +20dB

Model 250 M
power Stereo amplifier

meter range

0dB. +10dB
OFF. +20dB

marantz®

MODEL 250M

SERVICE MANUAL

MARANTZ CO., INC. • P.O. BOX 99 • SUN VALLEY, CALIFORNIA • 91352
A WHOLLY OWNED SUBSIDIARY OF SUPERSCOPE INC., SUN VALLEY, CALIFORNIA 91352

PERFORMANCE SPECIFICATIONS

LOAD IMPEDANCE:	8 OHMS
POWER OUTPUT (Continuous Average Power Per Channel, Both Channels Driven):	126 WATTS
POWER BAND:	20Hz TO 20kHz
TOTAL HARMONIC DISTORTION:	0.1%
INTERMODULATION DISTORTION (At or Below Rated Power any Combination of Two Frequencies, 20Hz to 20kHz):	Less than 0.1%
FREQUENCY RESPONSE:	+0 - 1.5dB 2Hz to 100kHz ± 0.1 dB 20Hz to 20kHz
INPUT SENSITIVITY:	1.51 Volts for Rated Power
INPUT IMPEDANCE:	100K ohms
DAMPING FACTOR:	Greater than 100 with an 8 ohm load
TOTAL NOISE:	Better than 106dB below rated power into an 8 ohm load
POWER REQUIREMENTS:	120V AC, 500W, 50/60Hz

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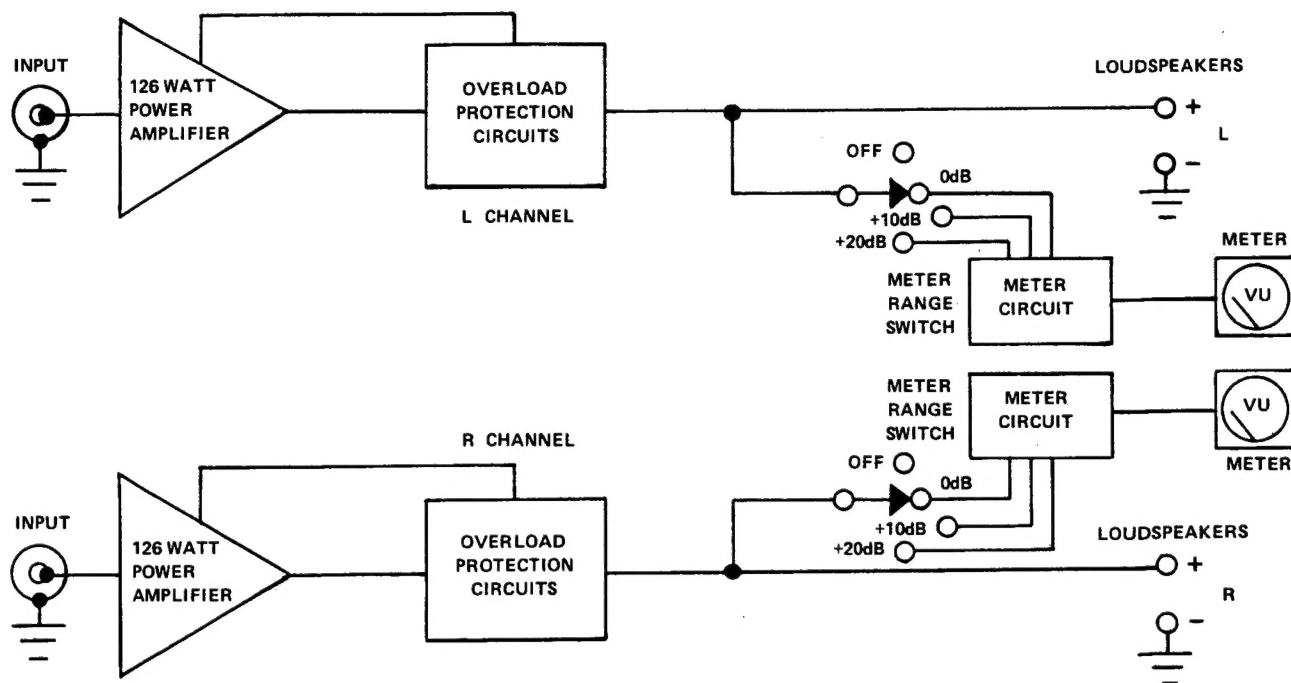


Figure 1. Model 250M Simplified Block Diagram

INTRODUCTION

This service manual was prepared for service personnel in factory-authorized warranty repair stations and other equally-qualified and equipped facilities. The service information contained herein is applicable to the Model 250M Stereo Power Amplifier, manufactured by the Marantz Company, a subsidiary of Superscope Incorporated, Sun Valley, California 91352.

Performance evaluation tests and service of the Model 250M should be undertaken only by the experienced technician, one knowledgeable in solid-state amplifier operation and use of the test equipment. All instructions should be read carefully and understood fully before proceeding with any service. To better understand the functions of this amplifier, consult the Block Diagram, Figure 1, the Schematic Diagram, Figure 2, the Wiring Diagram, Figure 3, and the circuit description of the unit.

Supplementary service bulletins will be issued to all repair facilities for upgraded service and product support. To improve this service, Marantz Company requests field problems and suggestions for improvement be sent to the Technical Services Manager at our corporate location.

WARNING:

1. The full line voltage exists at the terminal strip mounted at the top of the power transformer half-shell. Avoid touching these terminals for possible personal injury or equipment damage.
2. Do not discharge any capacitors in the Model 250M with a screw driver blade. The filter capacitors may store a sizeable charge and the current delivered through a short-circuit may be sufficient to vaporize the screw driver causing personal injury and equipment damage. Always use a 10-ohm 1 watt resistor for this purpose.

CAUTION:

1. All adjustments should be made using screw drivers with insulated blades and handles. Otherwise, adjacent components may short.
2. Never connect the loudspeaker terminals of one channel directly in parallel with those of any other, as the output devices will be severely damaged. Such damage is not covered under warranty.

CIRCUIT DESCRIPTION

This section is included to assist the service technician in understanding the operation of the Model 250M Stereo Power Amplifier. The technical data describes the basic operating principles of the Model 250M. The following circuit description will be based on the left channel only. The right channel operates identically.

A. POWER AMPLIFIER CIRCUIT

The input stage of the Power Amplifier circuit, Figure 2, is a unity gain, complementary feedback pair, (Q518 and Q519). The output of this stage is coupled through C502 and R506 to the differential amplifier (Q501, Q502), which drives an inverter (Q503) whose collector load is a current source Q504. The inverter is coupled to complementary pre-drivers (Q507, Q508). The outputs of the pre-drivers are applied to their respective drivers (Q510, Q511) which are coupled to their respective power transistors (Q802, Q804 – Q803, Q805).

Output current limiting is accomplished through a current-sensing network. Excessive current levels are sensed by resistors R531 and R532. Voltages developed across these resistors are applied to the current-sensing and level-shifting transistors Q516 and Q517.

When excessive current levels are detected, Q516 and Q517 turn on, turning on transistors Q505 and Q506. These transistors clamp the maximum drive signal to Q507 and Q508 on excessive output current peaks, thus limiting peak output current to a safe level.

Feedback for the amplifier is developed at the junction of R531 and R532. The feedback is applied across two loops. Feedback applied to R520 and C509 completes the driver-power output loop. Feedback applied to R519 and C508 completes the loop for the entire Power Amplifier circuit, and sets the voltage gain to 21v/v.

B. METER RANGE CIRCUIT

VU Meter M1 is connected to a full-wave diode bridge CR401 through CR404 with series resistor R405 supplied for proper damping the meter

movement. Meter calibration potentiometer R1 with resistors R401 through 404 comprise a three-position meter-range pad in increments of 10 dB.

C. RECTIFIER CIRCUIT

Eighty-six volts ac is applied to the full-wave bridge CR601, CR602, CR603, and CR604, which develops the +58.5 and -58.5 volt supply for the Power Amplifier Circuit. Resistors R601 and R602 serve to bleed the power supply after turn off.

D. TIME-DELAY RELAY CIRCUIT

The output of the Power Amplifier is applied to the wipers of relay K301 on the Relay Board, Figure 2. Relay K301 energizes after a minimum delay of two seconds after turn on. Power for Q301, Q302, Q303 and K301 is supplied by CR305 and CR306. The length of the delay is a factor of the time constant of R306, R309, and C302. This delay at turn-on is to prevent any transient surges from reaching the output terminals. Additionally, resistors R302 and R305 sample the audio output signals. Should a constant dc level more than +4.5 volts, or a high amplitude signal less than 10 Hz be present, Q301 will turn on, shorting the base of Q303 to ground. Q302 begins to discharge and K301 de-energizes. If a constant dc level more than -4.5 volts is present, the voltage drop across R304 bucks the voltage present at the base of Q303 and K301 de-energizes. The output from K301 is applied to the loudspeaker terminals.

TROUBLE ANALYSIS

The following partial list of possible malfunctions and causes should aid in situations where troubles may be difficult to isolate. Any field service problems that arise will be covered through service bulletins (supplementary to this manual) that will be issued to all service stations. We assume that normal trouble-shooting techniques, such as point-to-point signal tracing and oscilloscope analysis, will be used to isolate malfunctions.

NOTE: Performance Verification Tests are necessary following any repair.

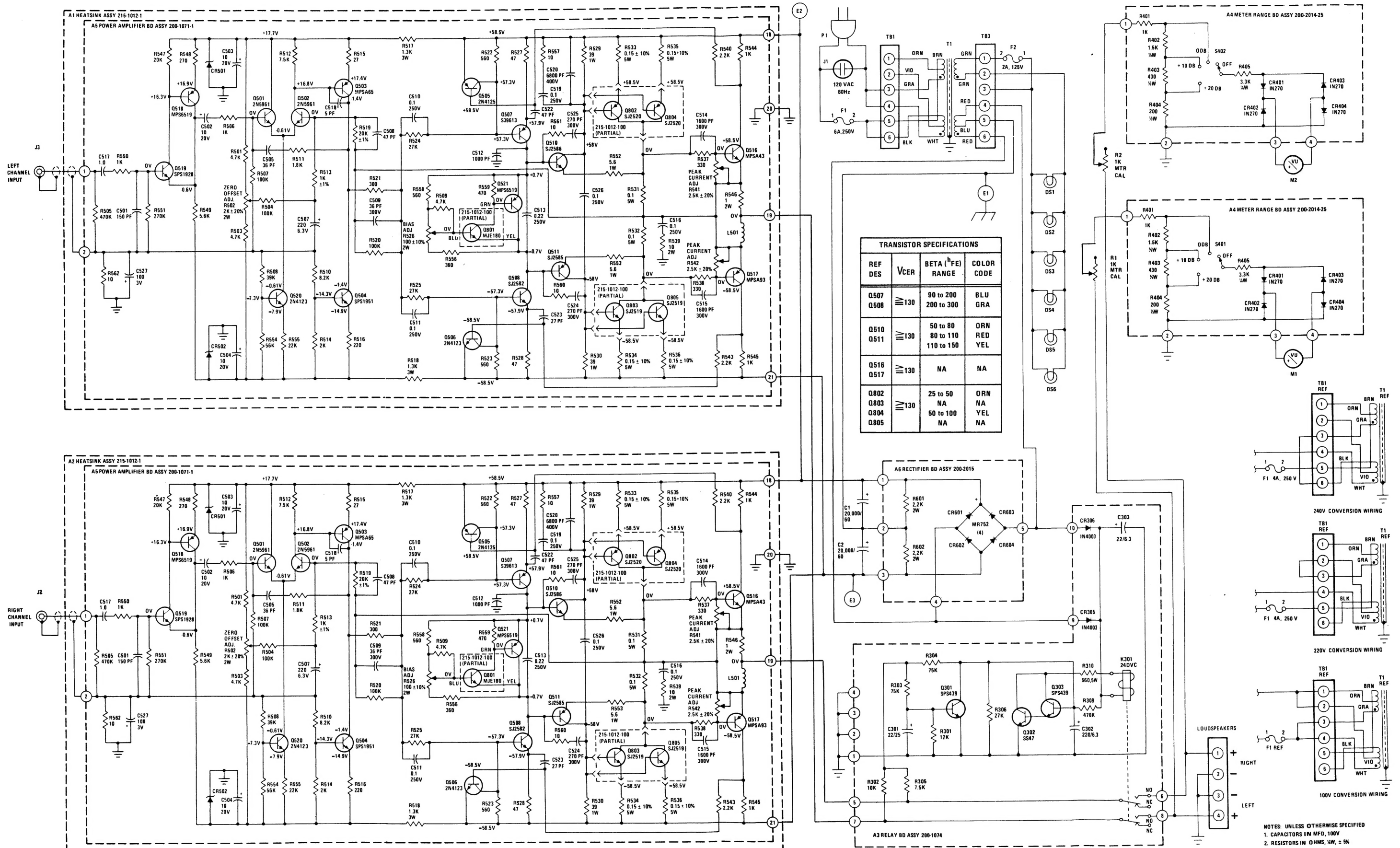


Figure 2. Model 250M Schematic Diagram

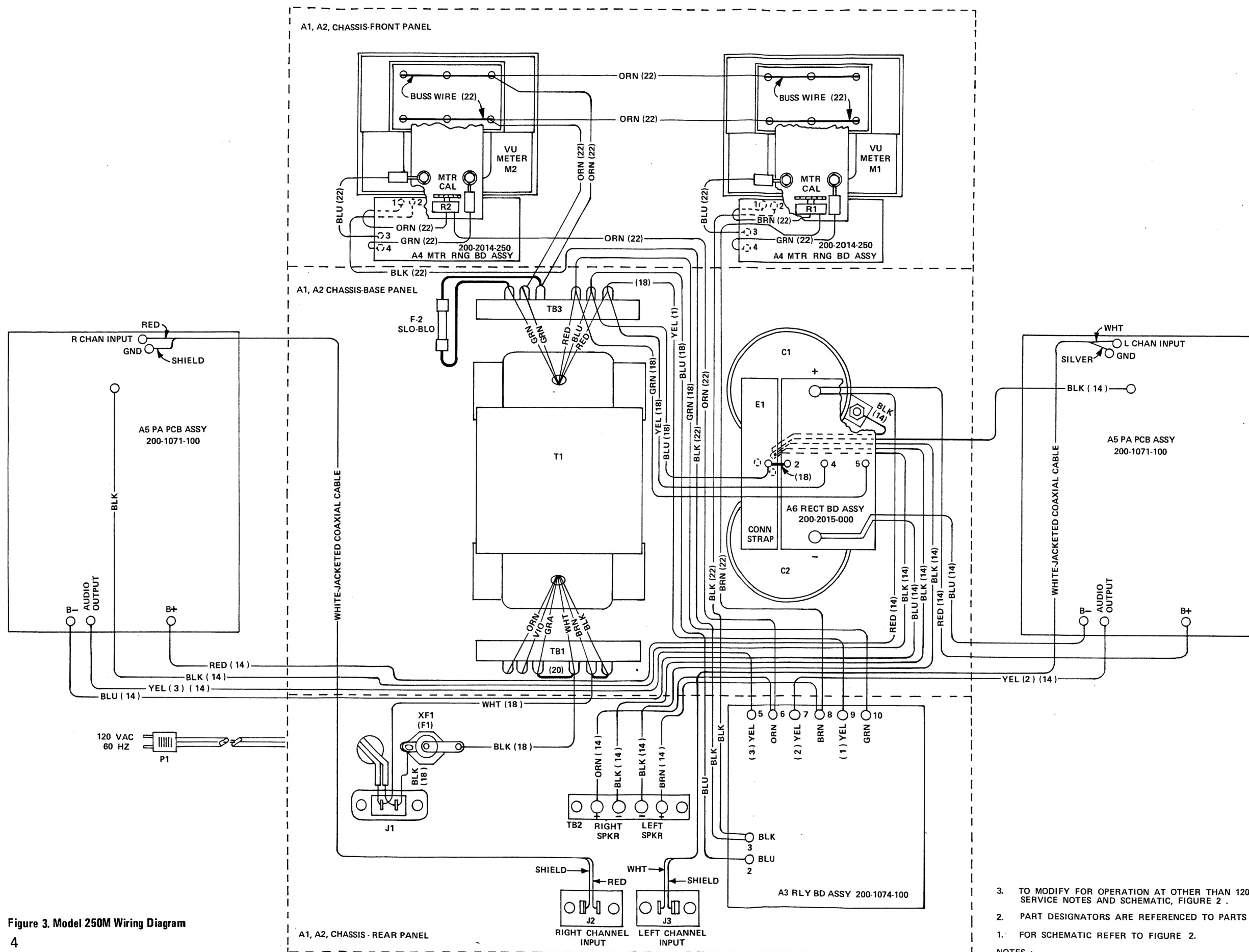


Figure 3. Model 250M Wiring Diagram

SYMPTOM	PROCEDURE
1. Excessive line consumption (80 watts or more)	a. Check for shorted rectifiers CR601 through CR604, CR305, or CR306. Also check C1, C2. b. Check for shorted transistors Q802 through Q805, Q507, Q508, Q510 or Q511. Check for open 215-1006-1 Bias Assembly. Check T1 for short.
CAUTION: Because the driver and output stages are directly coupled, components may fail as a direct result of an initial component failure. If a shorted semiconductor is found, be sure to check the remaining driver and output components for short or open circuits before re-energizing the amplifier. After replacement of any of these components, increase the variac voltage slowly while monitoring the wattmeter as described in paragraph C of Performance Verification.	
2. No line consumption or zero bias.	a. Check line cord, fuse, transistors Q507, Q508, Q510, Q511, Q802 through Q805, 215-1005-1 bias assembly. b. Check for open rectifiers CR301 through CR304, CR305, CR306 or open T1.
3. High DC voltage at loudspeaker terminals before time delay circuit is deactivated.	a. Check transistors Q301 through Q303 for leakage, shorted, or open.
4. High DC voltage at loudspeaker at all times.	a. Check R301 through R305 for open and Q301 through Q303 for leakage, shorted, or open.
5. No DC Balance.	a. Check Q501, Q502, R502, and Zener diodes CR501 and CR502. b. Check R501, R503. c. Check C502 for leakage.
6. High hum and noise level.	a. Check filter capacitors C1, C2, C501 and C504.
7. Parasitic Oscillation.	a. Check for defective C505, C508, C509, C512, C518, C519, C520 and C525.
8. Improper clipping.	a. Check for proper adjustment of R541, R542. b. Check for transistors Q802 through Q805.

Table 1. Trouble Analysis

SYMPTOM	PROCEDURE
9. Relay Latching.	a. Check Q301 through Q303. b. Check output for proper clipping into 4-ohm load with 25.5 V AC output (positive and negative levels must not vary more than 1.0 V at 2 kHz). c. Check for high level DC offset at junction of R302 and R305.
10. No output.	a. Check R529, Q510, Q511, Q802, Q803, Q804 and Q805.

Table 1. Trouble Analysis (continued)

PERFORMANCE VERIFICATION

All test, adjustment, or alignment procedures described below should be performed after any repair or adjustment. The tests described in paragraphs C through M may also be used as a method of isolating the defect before service. Should the results of the tests be other than as specified, refer to the Trouble Analysis section of this manual. Unless otherwise specified, all tests are to be performed on both audio channels, with the results specified applying to each channel.

A. TEST EQUIPMENT

Refer to Table 2 for list of recommended test equipment.

B. PRELIMINARY PROCEDURES

1. All tests are performed with the unit under test and the test equipment connected as shown in Figure 6. All tests are conducted with 120 V ac line voltage applied to unit. Unless otherwise specified in the procedure, the test equipment controls will be set to the following positions.

AC Power Control Box:

Line Switch ON
 Wattmeter Switch. DIRECT
 Autotransformer . . 120 V AC LINE

Amplifier Output Load Box:

Channel Select . SET FOR CHANNEL
 UNDER TEST

Short Switch

(momentary). CENTER (OFF)

Load Switch. AS REQUIRED
 BY TEST

Capacitance Switch OUT

2. Connections, between the output (loud-speaker) terminals of the Model 250M and the Output Load Box, must have negligible resistance with respect to the resistance of the load itself. Appreciable resistance adds to the total load, resulting in inaccurate measurement of output power.
3. Refer to Figure 2, Schematic Diagram and Figure 3, Wiring Diagram to locate detailed parts and wires referenced.

C. DC BALANCE ADJUSTMENT

1. Connect oscilloscope to L Channel loud-speaker terminals.
2. Set Line Switch to ON and advance auto-transformer to 120 V ac.

Table 2 lists the test equipment recommended for servicing the Model 250M Stereo Power Amplifier. The wattmeter, AC voltmeter, and autotransformer may be assembled as a test fixture as shown schematically in Figure 4, and the load resistors and AC ammeter may be assembled into a second test fixture as shown in Figure 5.

Item	Manufacturer and Model No. (or equivalent)	Use
Distortion Analyzer	Hewlett Packard, Model 331A or 333A; Sound Technology Model 1700A	Measures distortion and voltage of amplifier output.
Audio Oscillator	Weston Model CVO-100P (NOTE: Less than 0.02% residual distortion is required.) Sound Technology Model 1700A	Sinewave and squarewave signal source.
Oscilloscope	Tektronix, Model 503; Data, Model 555	Waveform analysis and troubleshooting.
VTVM	RCA Senior Volt-Ohmyst, Model WV-98C	Voltage and resistance measurements.
AC Wattmeter (0 to 150W)	Simpson, Model 390	Monitors primary power consumption of amplifier.
AC Ammeter (0 to 10A)	Commercial Grade	Monitors amplifier output under short circuit condition.
Line Voltmeter (0 to 150 V AC)	Commercial Grade	Monitors potential of primary power to amplifier.
Variable Autotransformer (0 to 140 V AC 10A)	Powerstat, Model 116B (Variac)	Adjusts level of primary power to amplifier.
Shorting Plug	Use phono plug with 600 ohms across center pin and shell.	Shorts amplifier input to eliminate noise pickup.
Power Supply Bleeder Resistor (10 ohms at 1 W)	Commercial Grade	Discharges power supply filter capacitors prior to disassembly or resistance measurements.
Output Load Resistor (8 ohms \pm 0.5%, 250W)	Commercial Grade	Provides 8-ohm load for amplifier output termination.
Output Load Resistor (4 ohms \pm 0.5%, 250W)	Commercial Grade	Provides 4-ohm load for amplifier output termination.
Output Load Capacitor (0.5 mfd 300V)	Mylar	Provides capacitive load for instability checks.
AC Power Control Box	Optional Item. Fabricate in accordance with Figure 4.	Monitors and controls primary power for amplifier.
Amplifier Output Load Load Box	Optional item. Fabricate in accordance with Figure 5.	Provides various amplifier loads and can monitor shorted output.

Table 2. Recommended Test Equipment

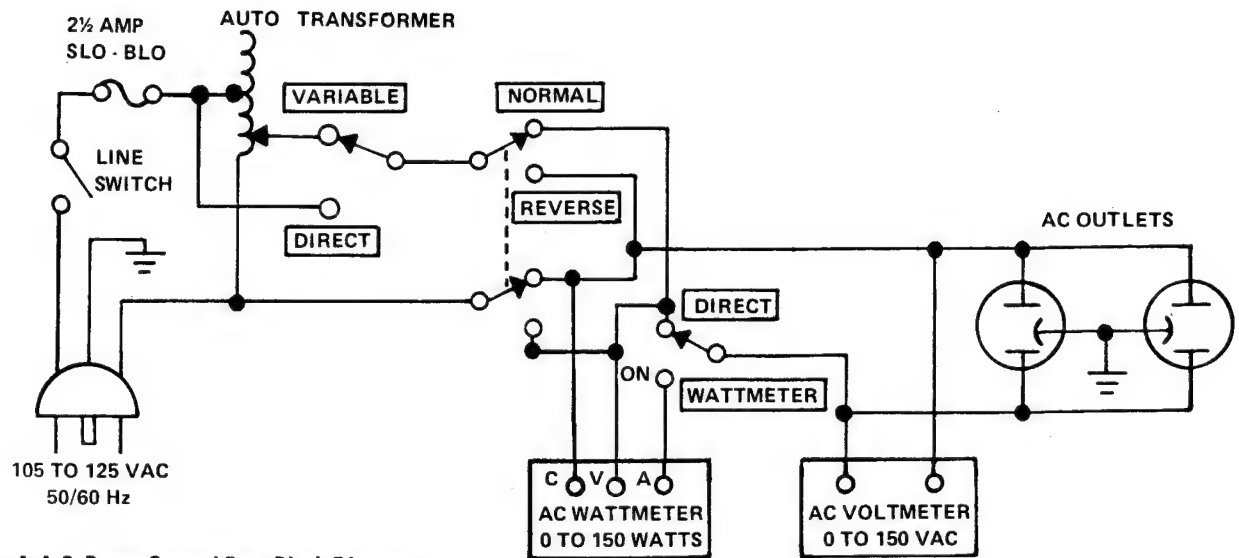


Figure 4. A.C. Power Control Box, Block Diagram

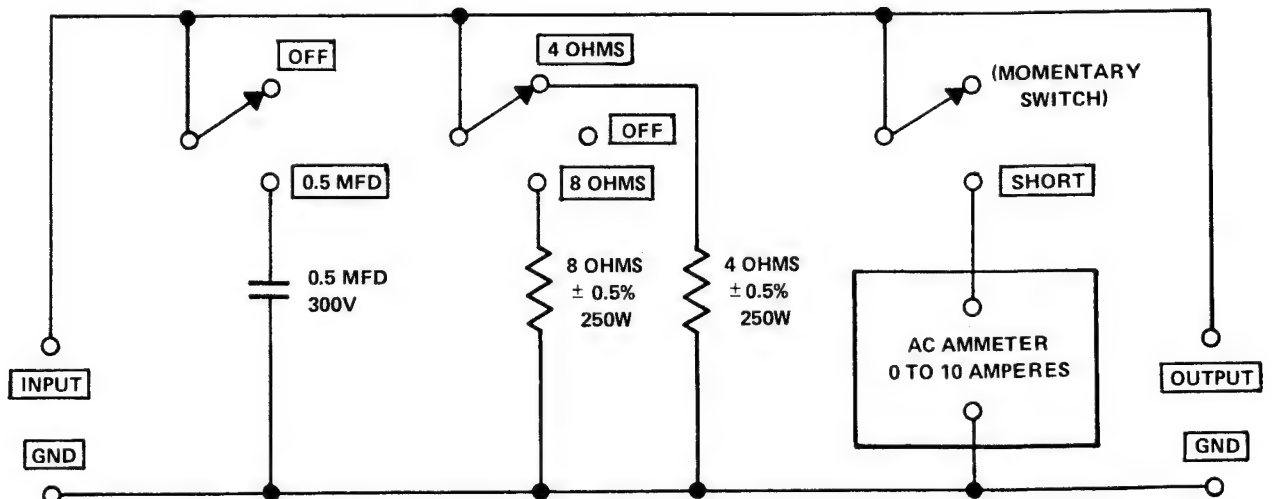


Figure 5. Amplifier Output Load Box, Block Diagram

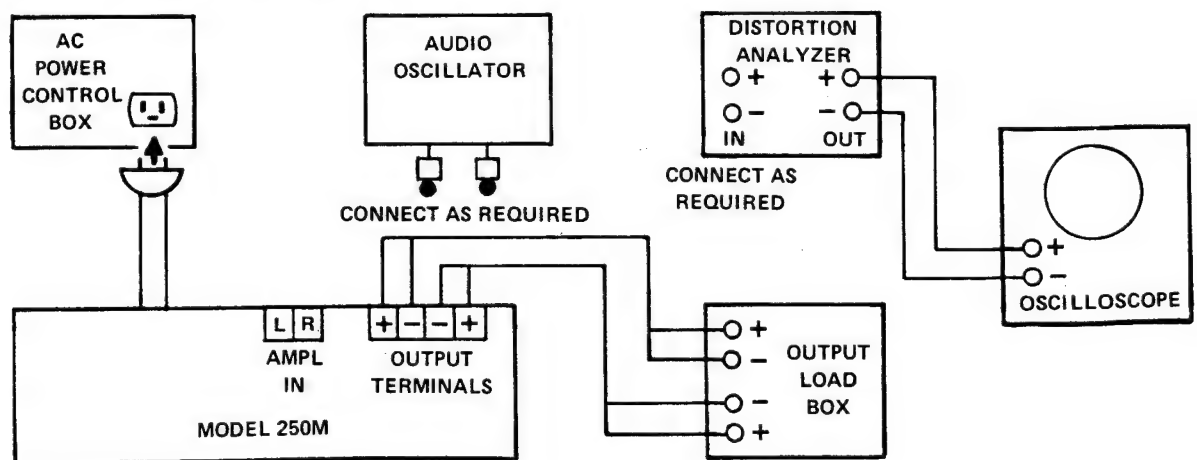


Figure 6. Test Equipment Connection, Block Diagram

3. After relay energizes, adjust L Channel (Left Hand Heatsink) amplifier board potentiometer R502 for an indication of a "line" zero ($0V \pm 50$ mV) as indicated on the oscilloscope.
4. Repeat test for R Channel (Right Hand Heatsink).

D. BIAS ADJUSTMENT

1. Set Line Switch to OFF. Preset the bias adjustment potentiometer R526 on each amplifier board fully CCW, Figure 2.
2. Set the Wattmeter to ON and set variac to 0.
3. Set Line Switch to ON and slowly advance variac while observing the wattmeter. The Wattmeter should indicate less than 50 W at 120 V. If the wattmeter indicates either 0 or more than 50 W, unit is defective. Turn off and correct fault.
4. Connect a low-range voltmeter across series combination of R531 and R532 (voltmeter set to 0-100 mV range), Figure 14.

NOTE: Transistor cases serve as convenient measuring points for test probes.

5. Observe wattmeter indication. Adjust the L Channel bias adjustment potentiometer R526 for voltmeter reading between 12 and 15 mV.
6. Repeat for R Channel.

NOTE: A 12mV drop across the series resistance (R531 and R532) represents 60mA idling current in the output stage. A 15mV drop represents 75mA idling current.

NOTE: AC line voltage must be maintained at 120V at all times during remaining tests.

E. MAXIMUM POWER OUTPUT

1. Connect the audio oscillator to the input jacks. Set the audio oscillator frequency to 20 kHz.

2. Connect the distortion analyzer across the L Channel output load (4 ohms), set the analyzer to the 30 V AC scale.
3. Turn the peak current adjustment potentiometers R541 and R542 fully CCW.
4. Set Line Switch to ON. Turn the analyzer and audio generator to ON. Increase the audio oscillator output until the analyzer indicates 25.3 V.
5. Rotate potentiometer R541 clockwise until the positive peak of the waveform, as observed on the oscilloscope, just begins to clip.
6. Rotate potentiometer R542 clockwise until the negative peak just begins to clip.
7. Change output load to 8 ohms. Set oscillator sequentially to 20 Hz, 2 kHz, and 20 kHz. Output voltage should not be less than 31.75 V.
8. Set Line Switch to OFF. Connect test equipment for R Channel and repeat Steps 4 through 7.

F. HARMONIC DISTORTION TEST

1. Set audio oscillator frequency to 20 Hz and adjust level for 31.75V output. Set distortion analyzer to SET LEVEL — MANUAL mode. Adjust sensitivity for full scale reading on 0-1 scale.
2. Switch distortion analyzer to DISTORTION mode and monitor L Channel output. Total harmonic distortion should be no more than 0.1%.
3. Repeat test for L Channel with audio oscillator frequency set at 20 kHz.
4. Repeat test for L Channel at 20 Hz and 20 kHz with 0.5 mfd capacitor across load. Total harmonic distortion should not exceed 0.1%. Verify absence of parasitic oscillation.
5. Perform Steps 2, 3, and 4 for R Channel.

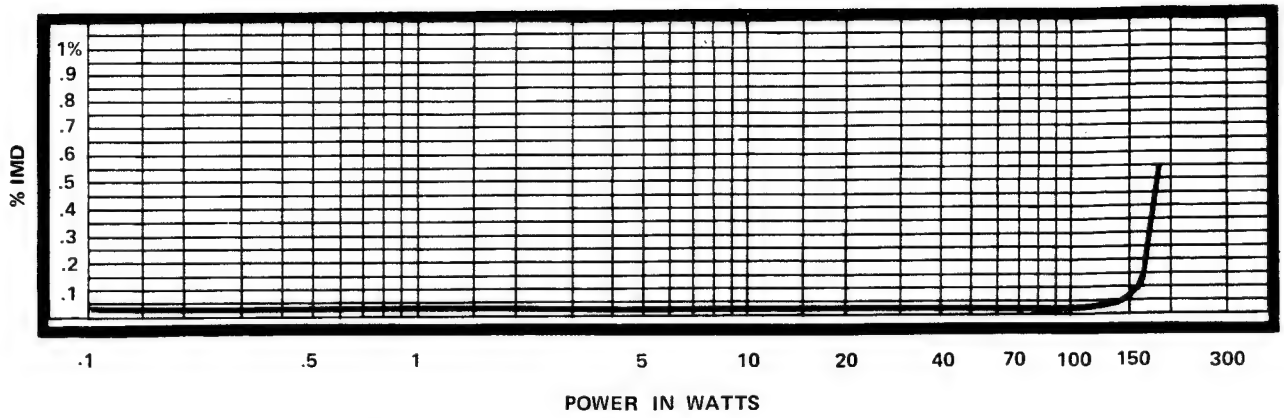


Figure 7A. Intermodulation Distortion vs Power Output

Test frequencies: 60 Hertz, 7,000 Hertz

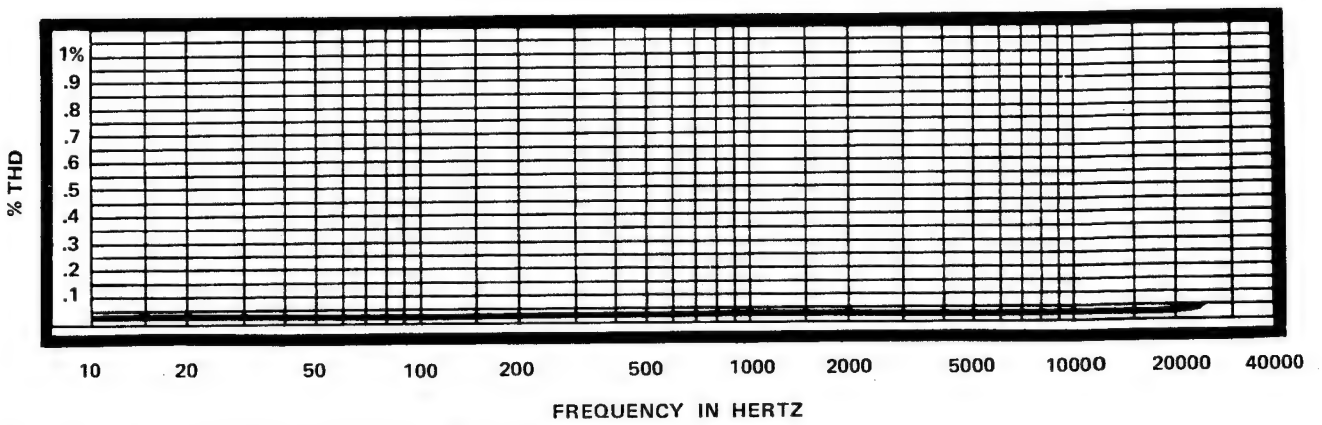


Figure 7B. Harmonic Distortion vs Frequency, 1 Watt Output

With 8-ohm resistive load

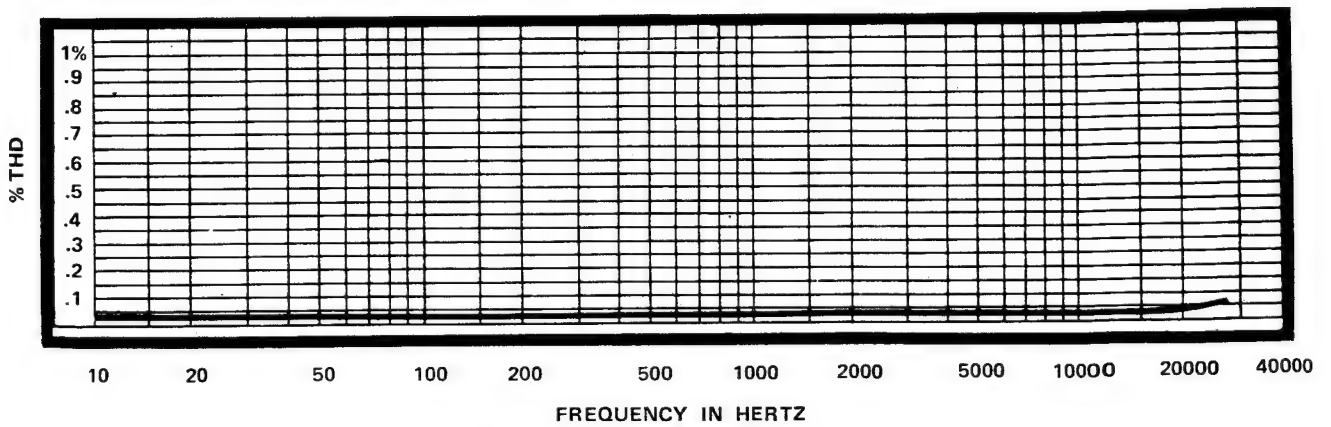


Figure 7C. Harmonic Distortion vs Frequency, 125 Watt Output

With 8-ohm resistive load

Figure 7. Typical Distortion Measurements

G. GAIN TEST

1. Apply a 1 kHz signal to the input jack of the L Channel. With an 8-ohm load, adjust the oscillator level for any convenient output voltage (between 20V and 30V), measured at the speaker terminals.
2. Measure the input voltage level. The difference between the input and output signal levels should be 26.4 dB \pm 0.5 dB.
3. Repeat for R Channel.

H. METER CALIBRATION PROCEDURE

1. Set the frequency of the audio oscillator to 1 kHz. Connect oscillator to L CHANNEL input jack. Connect analyzer to L CHANNEL loudspeaker terminal.
2. Set the controls of the analyzer for voltage measurement on the 30 V AC scale.
3. Set the L CHANNEL METER RANGE Switch to the +20 VU position.
4. Adjust the oscillator output at 1 kHz level until the amplifier output measures 22.45V rms (63W) into an 8-ohm load.
5. Observe L Channel VU meter. The meter should indicate 0 VU. If the meter does not indicate 0 VU, adjust meter calibration potentiometer R1 for a 0 VU indication on the meter.
6. Decrease amplitude of oscillator (10 V scale) for amplifier output of 7.1 V rms (6.3 W).
7. Set METER RANGE Switch to +10 VU position.
8. Verify VU meter for indication of 0 VU \pm 1 VU.
9. Decrease amplitude of oscillator (3 V scale) for amplifier output of 2.24V rms (0.63W).
10. Set METER RANGE Switch to 0 VU position.

11. Verify VU meter for indication of 0 VU \pm 1 VU.
12. Perform Steps 1-11 for R Channel METER RANGE Switch and R Channel VU meter. If calibration is necessary, adjust meter calibration potentiometer R2.

J. CHANNEL SEPARATION TEST

1. Apply the output of the audio oscillator to the L Channel input jack. Insert a shorting plug in the R Channel input jack.
2. With the Load Box set for an 8-ohm load, set the oscillator frequency to 20 kHz and the oscillator level for a convenient output voltage (between 20V and 30V), as measured at the speaker terminals.
3. Measure the output voltage of the R Channel and verify that it is 55 dB or more below the level of the driven channel.
4. Repeat test for L Channel output with R Channel driven.

K. TIME DELAY RELAY OPERATION

1. Set Line Switch to OFF. Wait approximately 30 seconds.
2. Set Line Switch to ON. The elapsed time between the instant the power is applied until the relay energizes should be between 2 and 10 seconds.
3. Set audio oscillator to 4 Hz with output reduced to minimum. Drive both channels.
4. Increase audio oscillator output slowly, observing the voltmeter. The relay should de-energize between 15 V and 32 V (contacts chatter.) as measured at the speaker output terminals.

L. TOTAL HUM AND NOISE TEST

1. Connect the voltmeter across the L Channel loudspeaker terminals.
2. With shorting plugs in the input jacks, the meter should display 0.2 mV or less.
3. Repeat test for R Channel.
4. Set Line Switch to OFF and adjust variac to 0 (fully CCW).

M. FREQUENCY RESPONSE

1. Verify square wave response at 1-Watt level for distortion - free performance (10 V peak-to-peak into 8-ohm load), as shown in Figure 8.

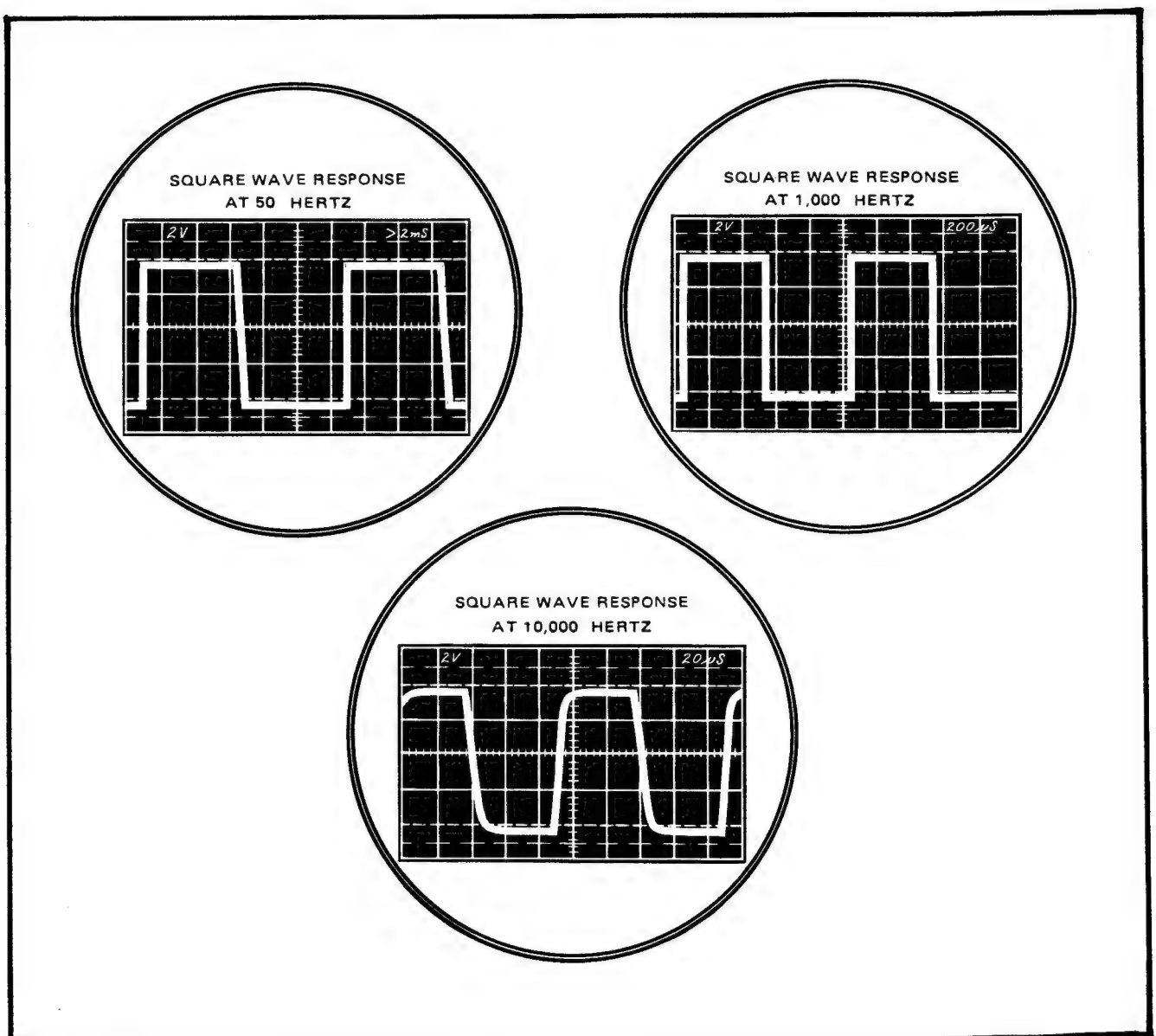


Figure 8. Square Wave Response

SERVICE NOTES

A. 100-VOLT AC CONVERSION

To convert the Model 250M to 100-volt operation, refer to Figure 3, Wiring Diagram and perform the following steps:

1. Remove the top cover.
2. Turn the Model 250M to face the rear panel.
3. Locate TB1, the strip located on the power transformer half shell facing the rear panel, which terminates the power transformer primary wires.
4. Unsolder the black and white power lead-in wires and all jumpers from TB1.
5. Solder two jumpers (18 AWG) to TB1, one connecting the orange and violet transformer wires, and one connecting the gray and white transformer wires. Solder the black and white power lead-in wires to the white and orange transformer wires, respectively, at TB1.
6. Re-attach the top cover.
7. Affix labels, supplied in the 100-volt conversion kit, Parts List 103-2000-100V, in the appropriate locations on the unit cover, and adjacent to the line cord and accessory outlets.

The Model 250M is now ready for 100-volt operation.

B. 220-VOLT AC CONVERSION

To convert the Model 250M to 220-volt operation, refer to Figure 3, Wiring Diagram and perform the following steps:

1. Remove the top cover.
2. Turn the Model 250M to face the rear panel.
3. Locate TB1, the strip located on the power transformer half shell facing the rear panel, which terminates the power transformer primary wires.

4. Unsolder all jumpers from TB1.
5. Solder a jumper (18 AWG) to TB1 connecting the gray and violet transformer wires.
6. Re-attach the top cover.
7. Replace the 6-amp, 250V fuse in the unit with the 4-amp, 250V fuse supplied with the 220-volt conversion kit, Parts List 103-2000-220V.
8. Affix labels, supplied in conversion kit, in the appropriate locations on the unit cover, and adjacent to the line cord, fuse holder and accessory outlets.

The Model 250M is now ready for 220-volt operation.

C. 240-VOLT AC CONVERSION

To convert the Model 250M to 240-volt operation, refer to Figure 3, Wiring Diagram and perform the following steps:

1. Remove the top cover.
2. Turn the Model 250M to face the rear panel.
3. Locate TB1, the strip located on the power transformer half shell facing the rear panel, which terminates the power transformer primary wires.
4. Unsolder all jumpers from TB1.
5. Solder a jumper (18 AWG) to TB1 connecting the gray and black transformer wires.
6. Re-attach the top cover.
7. Replace the 6-amp, 250V fuse in the unit with a 4-amp, 250V fuse.
8. Affix labels noting conversion, in the appropriate locations.

The Model 250M is now ready for 240-volt operation.

REPACKING FOR SHIPMENT

Should the unit require repacking for shipment, observe the following precautions:

- A. Do not ship the unit with the walnut cabinet installed; remove the unit from the cabinet before packing.
- B. Pack the unit carefully, using the original material as shown in Figure 9.

NOTE: If the packing material was lost, discarded, or damaged, new packing material may be obtained by writing to the Marantz Technical Services Department. The carton, its fillers, and packing instructions will be returned to you at a nominal charge.

- C. Ship by a reputable carrier (do not use Parcel Post) and obtain a shipping receipt from the carrier.
- D. Insure the unit for its full value.
- E. Be sure to include your return address on the shipping label.

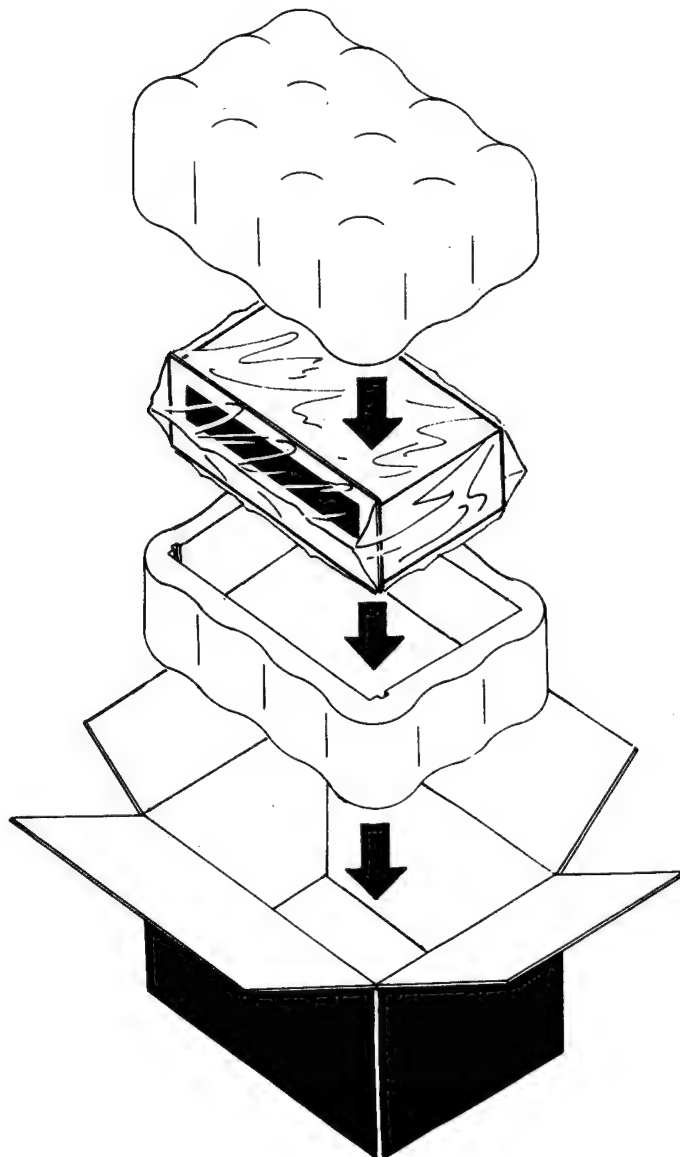


Figure 9. Repacking Illustration

PARTS LIST

The following illustrated parts list is supplied for parts location and identification. Parts listed are referenced on Figures 2 and 3, and shown on Figures 10 through 16. Parts are listed alphabetically by reference designations from major assemblies down to detail parts within those assemblies. Part numbers with fewer than ten digits require zeros to complete.

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE	
POWER AMPLIFIER UNIT			
	136-1017	TRANSISTOR COVER	x2
	136-1008	TOP COVER	
	136-2010	SHIELD, DRESS PANEL	
	174-2000	KNOB, METER RANGE	x2
	180-1092	LABEL, UL APPROVED	
	180-2004-1	LABEL, S/N (SERIALIZED)	
	585-1008	LABEL, CAUTION	x3
	671-4332	LOCKWASHER NO. 6, SPT SPR, BLK	x16
	769-2010	DRESS BOLT	x4
	775-3242	SET SCREW, 8-32 x 1/4, BLK	x2
	784-4112	SCREW, 6-32 x 1/4, TF, CRSHD, BLK	x16
	206-2002-1	FRONT DRESS PANEL ASSEMBLY	
FIG. 10	230-2000-1	CHASSIS ASSEMBLY	
C1, C2	381-1041	CAPACITOR, ELECTROLYTIC, 20,000 MFD, 60V	
DS1 thru DS6	482-2004	LAMP, TUBULAR VU METER	
E1	150-1009-1	CONNECTOR STRAP	
F1	451-1013	FUSE, 6 AMP, 250V	
F2	451-1020	FUSE, PIGTAIL, 2A 125V	
J1	360-1034	OUTLET, A.C.	
J2, J3	360-1009	JACK, INPUT	
M1, M2	865-2001	METER, VU	x2
P1	361-1001	LINE CORD, A.C.	
R1, R2	420-2012	RESISTOR, VARIABLE, 1K \pm 20%, 1/4W, METER CALIBRATE	
T1	440-2008-1	TRANSFORMER, POWER	
TB1, TB3	362-1006	TERMINAL STRIP WITH .199 HOLES	
TB2	363-2000	TERMINAL BLOCK, SPEAKER	
XF1	367-1000	FUSEHOLDER (BAYONET TYPE)	
	132-2018	BRACKET, METER MOUNT	x4
	132-2008	BRACKET, EXTENSION	x2

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE	
	359-2006-001	STANDOFF, M5, SELF CLINCHING	x2
	132-2009	EXTENSION, COVER	x2
	133-2008	CHASSIS, MARKED	
	136-1051	INSULATOR	
	137-1010	BAR, RETAINER (XFMR)	x2
	137-1021	BRACKET, DOUBLER	
	153-2001	METER LAMP PANEL	x2
	169-2000	BOARD, PRESSURE PAD	
	180-1104	LABEL, CAUTION	
	239-2000-2	PRESSURE PAD ASSEMBLY	x2
	365-9450	RING TERMINAL	
	365-9821	RING TERMINAL	x4
	365-9832	RING TERMINAL	x4
	365-9822	RING TONGUE 22-16 NO. 10 SCR	x2
	561-1003	CLAMP, CAPACITOR	x2
	565-1001	BUSHING, STRAIN RELIEF	
	567-2000	FOOT, PLASTIC, BLK, W/PAD	x4
	650-3037	EYELET, 3/32 DIA, 3/32 LG	x3
	670-6872	WASHER, FL NO. 10, BLK	x4
	671-4332	LOCKWASHER, NO. 6, SPT SPR, BLK	x36
	671-5430	LOCKWASHER, NO. 8, SPT SPR, CD	x4
	671-6560	LOCKWASHER, NO. 10 SPT SPR, CD	x4
	671-6572	LOCKWASHER, NO. 10, SPT SPR, BLK	x4
	672-6610	LOCKWASHER, NO. 10, INTL T, CD	x2
	672-8716	LOCKWASHER, INTL T, 3/8	x2
	680-4222	NUT, HEX, NO. 6-32, BLK	x2
	680-5330	NUT, HEX NO. 8-32, CD	x4
	741-0412	SCREW, NO. 6-32 x 1/4, PNH, BLK	x14
	680-4330	NUT, HEX, 6-32 CD	
	689-1021	CLIP, NUT, U-TYPE, NO. 6-20	x7
	680-8726	NUT, HEX, 3/8-32 NI BR	x2
	741-0612	SCREW, 6-32 x 3/8 PNH, BLK	x4
	670-4552	WASHER, FL, NO. 6	

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
	741-0812	SCREW, NO. 6-32 x 1/4 PNH, CRSHD, BLK x2
	741-1012	SCREW, NO. 6-32 x 5/8, BLK x2
	761-0610	SCREW, NO. 10-32 x 3/8, PNH, CRSHD, CD x4
	761-0812	SCREW, NO. 10-32 x 1/2, PNH, CRSHD, BLK x4
	784-4112	SCREW, NO. 6-32 x 1/4, TF, CRSHD, BLK x18
	799-1011	SCREW, NO. 6-20 x 1/2, SH MET, TYPE Z, STL, BLK x5
	799-1012	SCREW, NO. 6-20 x 3/4, SH MET, TYPE Z, STL, CD x2
A1, A2	215-1017-1	HEATSINK ASSEMBLY
Q801	462-1067-02	TRANSISTOR, NPN, MJE180 (W/MTG. HDW)
Q802	461-1031-01	TRANSISTOR, PNP, SJ2520
Q803	462-1036-01	TRANSISTOR, NPN, SJ2519
Q804	461-1031-01	TRANSISTOR, PNP, SJ2520
Q805	462-1036-01	TRANSISTOR, NPN, SJ2519
	132-1058	HEATSINK BRACKET, COLLECTOR x2
	141-1016	HEATSINK, MACHINED
	157-1011	WIRE AND SOCKET SUB ASSEMBLY
	360-1051-2	SOCKET
	360-1051-1	CONTACT x3
	371-1006	TRANSISTOR INSULATOR
	671-4332	LOCKWASHER, SPT SPR, NO. 6, BLK x4
	671-4330	LOCKWASHER, SPT SPR, NO. 6, CD x2
	672-4400	LOCKWASHER, NO. 6, INTL T, CD x8
	676-1008	WASHER, NYLON SHLDR x8
	721-0612	SCREW, NO. 4-40 x 3/8, BLK
	741-0610	SCREW, NO. 6-32 x 3/8, CRSHD CD x2

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
	741-0810	SCREW, NO. 6-32 x 1/2, CRSHD, CD x8
	741-1012	SCREW, NO. 6-32 x 5/8, BLK x4
A3 FIG. 11, 12	200-1074	RELAY BOARD COMPONENT ASSEMBLY
C301	381-1046	CAPACITOR, ELECTROLYTIC, 22 MFD, 25V
C302	381-1044	CAPACITOR, ELECTROLYTIC, 220 MFD, 6.3V
C303	381-1040	CAPACITOR, ELECTROLYTIC, 22 MFD, 63V
CR301 thru CR304		(NOT USED)
CR305	460-1013	(NOT USED)
CR306	460-1013	DIODE, 1N4003
K301	410-1000	RELAY, DPDT
Q301	462-1000	TRANSISTOR, NPN, SPS439
Q302	462-1007	TRANSISTOR, NPN, SS47
Q303	462-1000	TRANSISTOR, NPN, SPS439
R301	433-5122	RESISTOR, C-F, 12K \pm 5%, 1/2W
R302	433-5102	RESISTOR, C-F, 10K \pm 5%, 1/2W
R303	433-5752	RESISTOR, C-F, 75K \pm 5%, 1/2W
R304	433-5752	RESISTOR, C-F, 75K \pm 5%, 1/2W
R305	433-4752	RESISTOR, C-F, 7.5K \pm 5%, 1/2W
R306	433-5272	RESISTOR, C-F, 27K \pm 5%, 1/2W
R307		(NOT USED)
R308		(NOT USED)
R309	433-6472	RESISTOR, C-F, 470K \pm 5%, 1/2W
R310	428-3562	RESISTOR, WW, 560 OHMS \pm 5%, 5W

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
	372-1000	INSULATOR, TRANSISTOR MOUNTING
	560-4042	STANDOFF, SWAGE, NO. 6-32
A4 FIG. 15	200-2014-25	METER RANGE BOARD COMPONENT ASSEMBLY
CR401	460-2001	DIODE, 1N270
CR402	460-2001	DIODE, 1N270
CR403	460-2001	DIODE, 1N270
CR404	460-2001	DIODE, 1N270
R401	433-4102	RESISTOR, C-F, 1K \pm 5%, 1/2W
R402	433-4152	RESISTOR, C-F, 1.5K \pm 5%, 1/2W
R403	433-3432	RESISTOR, C-F, 430 OHMS \pm 5%, 1/2W
R404	433-3202	RESISTOR, C-F, 200 OHMS \pm 5%, 1/2W
R405	434-4332	RESISTOR, C-F, 3.3K \pm 5%, 1/4W
S401	453-2005	SWITCH, ROTARY
S402	453-2005	SWITCH, ROTARY
A5 FIG. 13, 14	200-1071-1	POWER AMPLIFIER BOARD COMPONENT ASSEMBLY
		CAPACITORS ARE \pm 10%, 100V UNLESS OTHERWISE SPECIFIED.
C501	385-1038	CAPACITOR, 150 PF
C502	381-1068	CAPACITOR, ELECTROLYTIC, TA, 10 MFD, 20V
C503	381-1068	CAPACITOR, ELECTROLYTIC, TA, 10 MFD, 20V
C504	381-1068	CAPACITOR, ELECTROLYTIC, TA, 10 MFD, 20V
C505	385-1064	CAPACITOR, 36 PF, \pm 5%, 100V

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
C506		(NOT USED)
C507	381-1044	CAPACITOR, ELECTROLYTIC, 220 MFD, 6.3V
C508	385-1040	CAPACITOR, 47 PF
C509	385-1018	CAPACITOR, 36 PF \pm 10%, 300V
C510	386-1000	CAPACITOR, 0.1 MFD, \pm 10%, 250V
C511	386-1000	CAPACITOR, 0.1 MFD, \pm 10%, 250V
C512	385-1068	CAPACITOR, 1000 PF
C513	386-1017	CAPACITOR, 0.22 MFD, \pm 10%, 250V
C514	385-1020	CAPACITOR, 1600 PF, \pm 10%, 300V
C515	385-1020	CAPACITOR, 1600 PF, \pm 10%, 300V
C516	386-1000	CAPACITOR, 0.1 MFD, \pm 10%, 250V
C517	388-1001	CAPACITOR, 1.0 MFD, \pm 20%, 100V
C518	385-1049	CAPACITOR, 5 PF
C519	386-1000	CAPACITOR, 0.1 MFD, \pm 10%, 250V
C520	386-1026	CAPACITOR 6800 PF, \pm 10%, 400V
C521		(NOT USED)
C522	385-1040	CAPACITOR, 47 PF
C523	385-1036	CAPACITOR, 27 PF
C524	385-1090	CAPACITOR, 270 PF, \pm 10%, 300V
C525	385-1090	CAPACITOR, 270 PF, \pm 10%, 300V
C526	386-1000	CAPACITOR, 0.1 MFD, \pm 10%, 250V
C527	381-1089	CAPACITOR, ELECTROLYTIC, 100 MFD, 3V
CR501	459-1006	DIODE, ZENER
CR502	459-1006	DIODE, ZENER
CR503		(NOT USED)
L501	147-1009	TOROID
Q501	462-1066-01	TRANSISTOR, NPN, 2N5961

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
Q502	462-1066-01	TRANSISTOR, NPN, 2N5961
Q503	461-1054-01	TRANSISTOR, PNP, MPSA65
Q504	462-1044	TRANSISTOR, NPN, SPS1951
Q505	461-1036	TRANSISTOR, PNP, 2N4125
Q506	462-1042	TRANSISTOR, NPN, 2N4123
Q507	461-1056	TRANSISTOR, PNP, 2N3931
Q508	462-1068	TRANSISTOR
Q508	462-1068	TRANSISTOR, NPN, S40447
Q509		(NOT USED)
Q510	462-1054	TRANSISTOR, NPN, S40445
Q511	461-1046	TRANSISTOR, PNP, S40446
Q512		(NOT USED)
thru		
Q515		(NOT USED)
Q516	462-1058-01	TRANSISTOR, NPN, MPSA43
Q517	461-1050-01	TRANSISTOR, PNP, MPSA93
Q518	461-1055-01	TRANSISTOR, PNP, MPS6514
Q519	462-1038-21	TRANSISTOR, NPN, SPS1928
Q520	462-1042	TRANSISTOR, NPN, 2N4123
Q521	461-1055-01	TRANSISTOR, PNP, MPS6519
		RESISTORS ARE OHMS, $\pm 5\%$, 1/4W UNLESS OTHERWISE SPECIFIED.
R501	434-4472	RESISTOR, C-F, 4.7K
R502	420-1045	RESISTOR, VARIABLE, 2K, 2W
R503	434-4472	RESISTOR, C-F, 4.7K
R504	434-6102	RESISTOR, C-F, 100K
R505	434-6472	RESISTOR, C-F, 470K
R506	434-4102	RESISTOR, C-F, 1K
R507	434-6102	RESISTOR, C-F, 100K
R508	434-5392	RESISTOR, C-F, 39K
R509	434-4472	RESISTOR, C-F, 4.7K
R510	434-4822	RESISTOR, C-F, 8.2K
R511	434-4182	RESISTOR, C-F, 1.8K
R512	434-4752	RESISTOR, C-F, 7.5K
R513	431-4100	RESISTOR, PRECISION, 1K $\pm 1\%$, 1/4W
R514	434-4202	RESISTOR, C-F, 2K
R515	434-2272	RESISTOR, C-F, 27

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE
R516	434-3222	RESISTOR, C-F, 220
R517	439-1022	RESISTOR, M-F, 1.3K $\pm 5\%$, 3W
R518	439-1022	RESISTOR, M-F, 1.3K $\pm 5\%$, 3W
R519	431-5200	RESISTOR, PRECISION, 20K, $\pm 1\%$, 1/4W
R520	434-6102	RESISTOR, C-F, 100K
R521	434-3302	RESISTOR, C-F, 300
R522	434-3562	RESISTOR, C-F, 560
R523	434-3562	RESISTOR, C-F, 560
R524	434-5272	RESISTOR, C-F, 27K
R525	434-5272	RESISTOR, C-F, 27K
R526	420-1044	RESISTOR, VARIABLE, 100 $\pm 10\%$, 2W
R527	434-2472	RESISTOR, C-F, 47
R528	434-2472	RESISTOR, C-F, 47
R529	439-1023	RESISTOR, M-F, 39 $\pm 5\%$, 1W
R530	439-1023	RESISTOR, M-F, 39 $\pm 5\%$, 1W
R531	145-1002	RESISTOR, SPECIAL, 0.1 $\pm 5\%$, 5W
R532	145-1002	RESISTOR, SPECIAL, 0.1 $\pm 5\%$, 5W
R533	428-0153	RESISTOR, WW, 0.15 $\pm 10\%$, 5W
R534	428-0153	RESISTOR, WW, 0.15 $\pm 10\%$, 5W
R535	428-0153	RESISTOR, WW, 0.15 $\pm 10\%$, 5W
R536	428-0153	RESISTOR, WW, 0.15 $\pm 10\%$, 5W
R537	434-3332	RESISTOR, C-F, 330
R538	434-3332	RESISTOR, C-F, 330
R539	424-2102	RESISTOR, C-C, 10 $\pm 5\%$, 2W
R540	434-4222	RESISTOR, C-F, 2.2K
R541	420-1046	RESISTOR, VARIABLE, 2.5K $\pm 20\%$, 1/4W
R542	420-1046	RESISTOR, VARIABLE, 2.5K $\pm 20\%$, 1/4W
R543	434-4222	RESISTOR, C-F, 2.2K

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE	
R544	434-4102	RESISTOR, C-F, 1K	
R545	434-4102	RESISTOR, C-F, 1K	
R546	436-1102	RESISTOR, WW, 1.0 ± 5%, 2W	
R547	434-5202	RESISTOR, C-F, 20K	
R548	434-3272	RESISTOR, C-F, 270	
R549	434-4562	RESISTOR, C-F, 5.6K	
R550	434-4102	RESISTOR, C-F, 1K	
R551	434-6272	RESISTOR, C-F, 270K	
R552	423-1562	RESISTOR, C-C, 5.6 ± 5%, 1W	
R553	423-1562	RESISTOR, C-C, 5.6 ± 5%, 1W	
R554	434-5562	RESISTOR, C-F, 56K	
R555	434-5222	RESISTOR, C-F, 22K	
R556	434-3362	RESISTOR, C-F, 360	
R557	434-2102	RESISTOR, C-F, 10	
R558	434-3562	RESISTOR, C-F, 560	
R559	434-3472	RESISTOR, C-F, 470	
R560	434-2102	RESISTOR, C-F, 10	
R561	434-2102	RESISTOR, C-F, 10	
R562	434-2102	RESISTOR, C-F, 10	
	132-1024	HEATSINK, BRACKET	x2
	368-1006	SOCKET, TRANSISTOR (TO-3)	x8
	371-1007	MICA INSULATOR (TO-66)	x2
	372-1000	INSULATOR, TRANSISTOR MOUNTING	x2
	559-4061	SPACER, SWAGE, 3/8 LG	x4
	570-1003	RETAINER, TOROID	
	562-1000	HEAT DISSIPATOR, SNAP- ON	x2
	562-1007	THERMAL RETAINER, SKIRTED	

REFERENCE DESIGNATION	MARANTZ PART NUMBER	NOMENCLATURE	
	600-1000	CORE, TOROID	
	672-4400	LOCKWASHER, INTL T, NO. 6, CD	x4
	676-1006	WASHER, NYLON, NO. 6 x 1/4 O D x 1/32 THK	x4
	741-0610	SCREW, MACH, NO. 6-32 x 3/8, CRSHD, CD	x4
	741-1012	SCREW, NO. 6-32 x 5/8, CRSHD, PNH, BLK	
A6 FIG. 16	200-2015-1	RECTIFIER BOARD COMPONENT ASSEMBLY	
CR601	460-1014	DIODE, MR752	
CR602	460-1014	DIODE, MR752	
CR603	460-1014	DIODE, MR752	
CR604	460-1014	DIODE, MR752	
R601	436-4222	RESISTOR, WW, 2.2K ± 5%, 2W	
R602	436-4222	RESISTOR, WW, 2.2K ± 5%, 2W	
FIG. 9		PACKING SET	
	196-2000	INSERT, HALF	x2
	195-2000-14	CARTON, INNER	
	195-2000-54	CARTON, OUTER	
	199-2010	SERVICE MANUAL	
	199-2011	SCHEMATIC DIAGRAM	

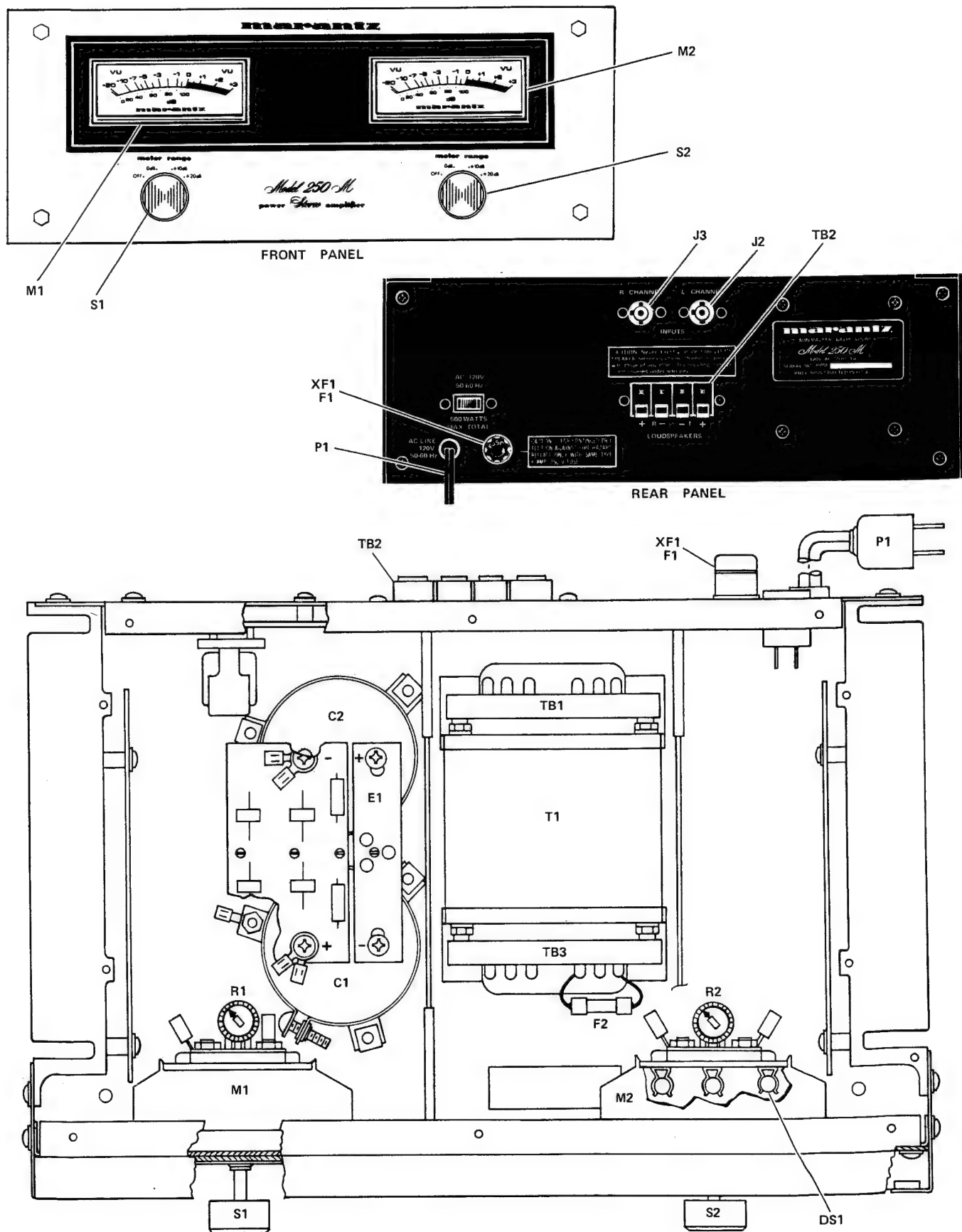


Figure 10. Chassis Assembly

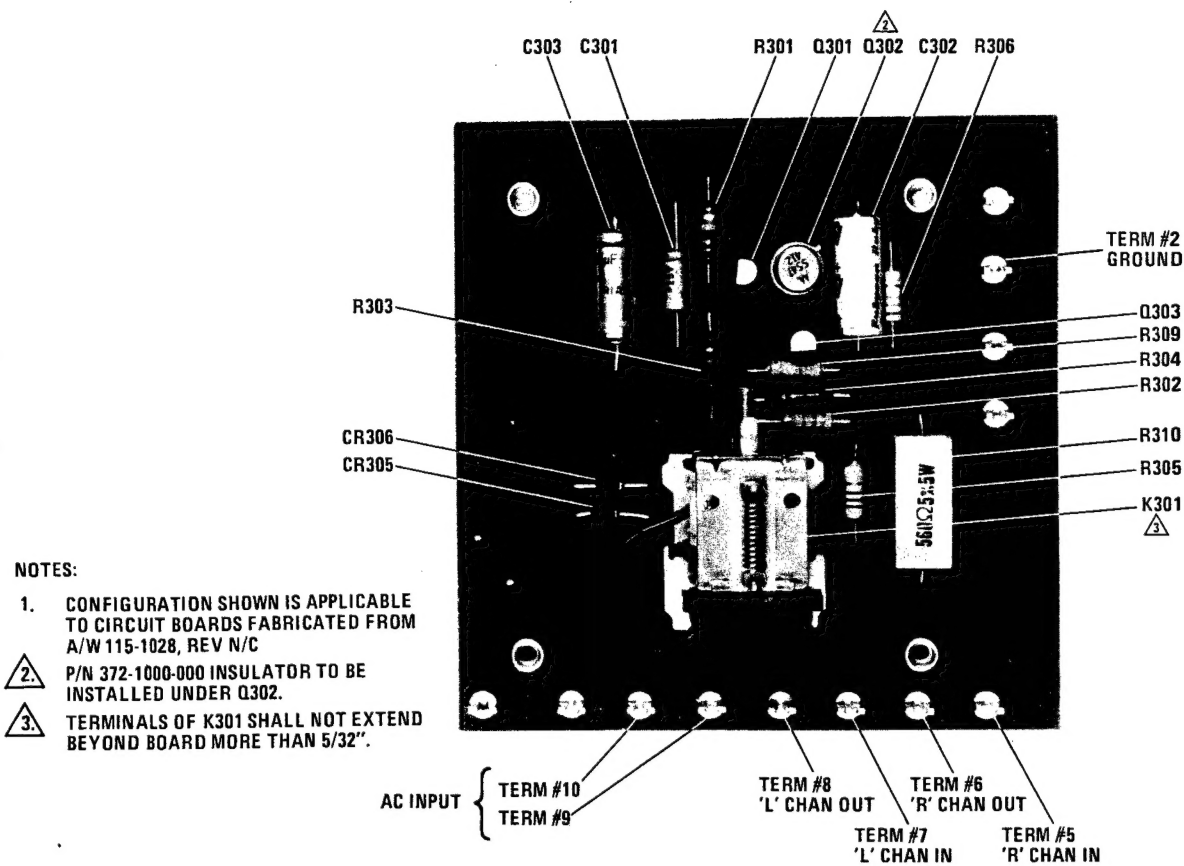


Figure 11. Time Delay Relay Printed Circuit Board Assembly - Component Side

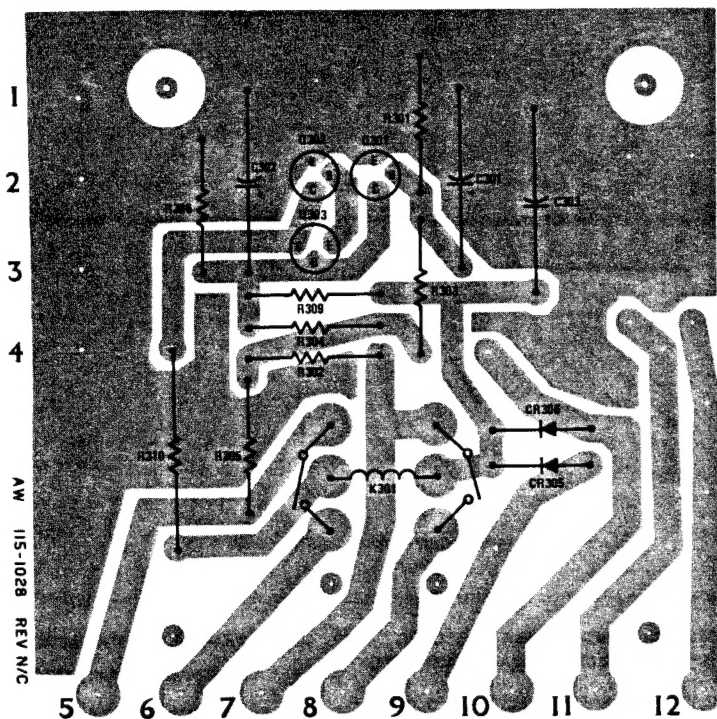
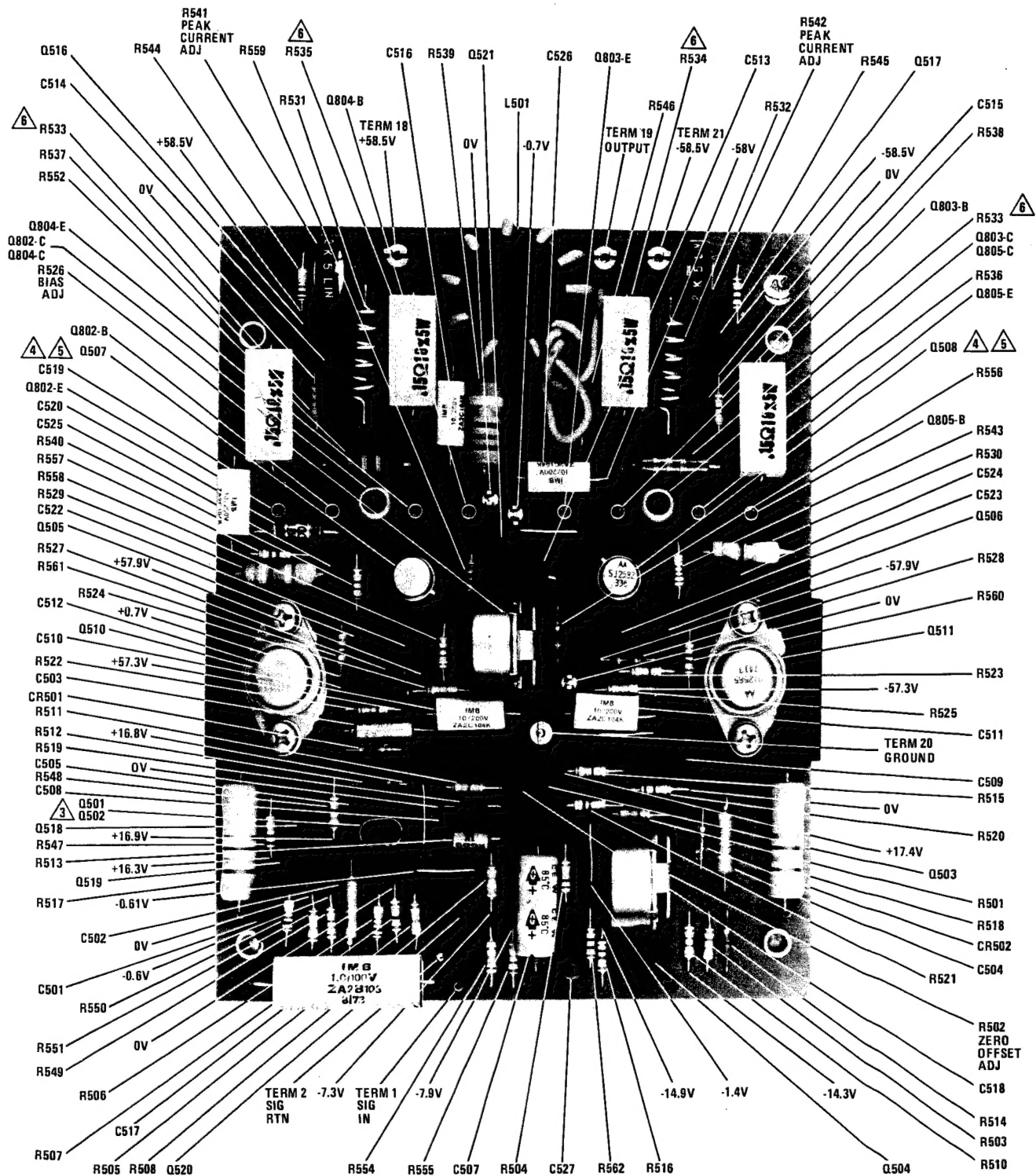
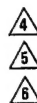


Figure 12. Time Delay Relay Printed Circuit Board Assembly - Circuit Side



NOTES:

1. VOLTAGES ARE DC VOLTS TO GROUND, MEASURED ON A TYPICAL UNIT.
2. CONFIGURATION SHOWN IS APPLICABLE TO CIRCUIT BOARDS FABRICATED FROM A/W 115-1071, REV N/C.
3. TRANSISTOR PAIR Q501-Q502 ARE TO BE EQUALLY SPACED OFF THE BOARD WITH THEIR ENTIRE FLAT SURFACES IN INTIMATE CONTACT. P/N 562-1005-000 THERMAL RETAINER TO BE INSTALLED ON THE PAIR.



- P/N 562-1000-000 HEAT DISSIPATOR TO BE INSTALLED ON Q507 AND Q508.
- P/N 372-1000-000 INSULATOR TO BE INSTALLED UNDER Q507 AND Q508.
- RESISTORS R533, R534, R535 AND R536 TO BE INSTALLED 1/8" MINIMUM OFF BOARD.

Figure 13. Power Amplifier Printed Circuit Board Assembly - Component Side

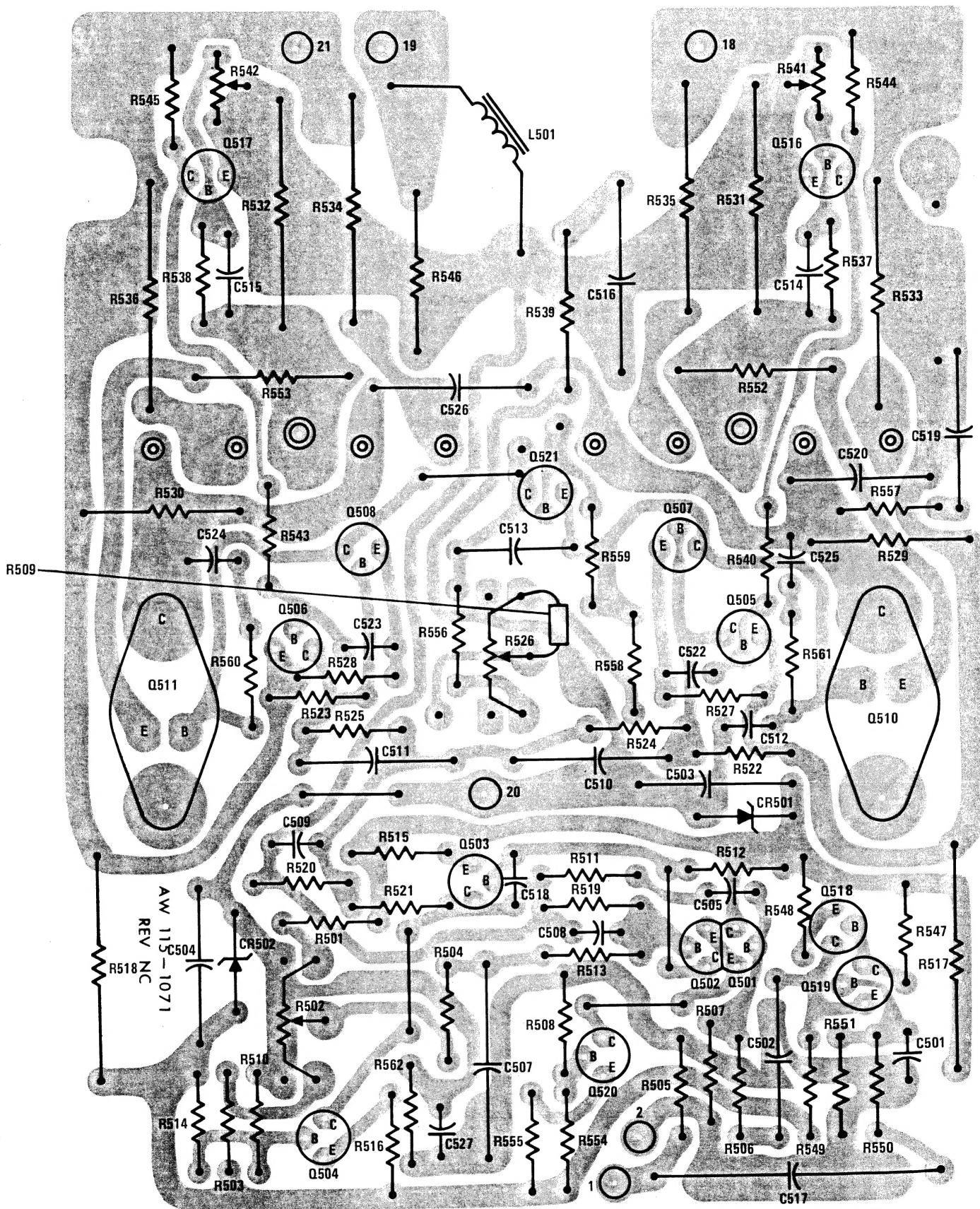


Figure 14. Power Amplifier Printed Circuit Board Assembly - Circuit Side

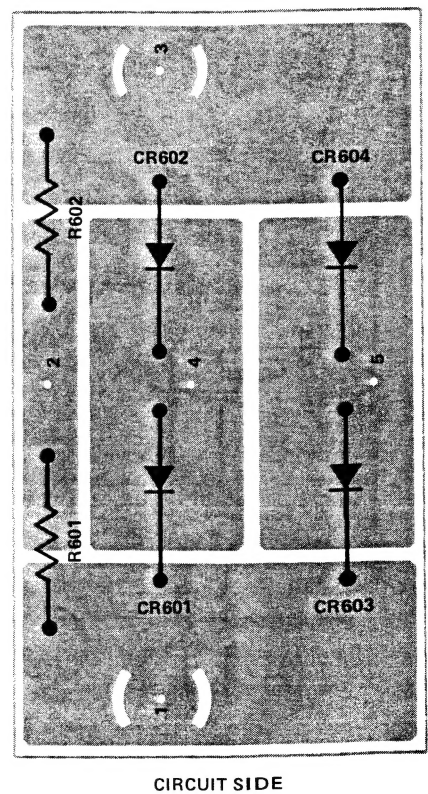
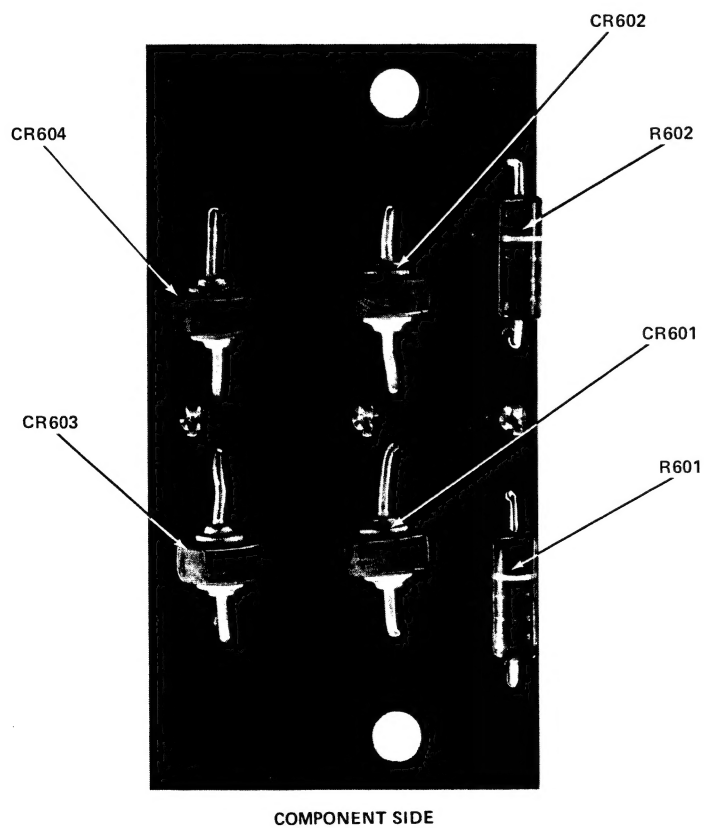
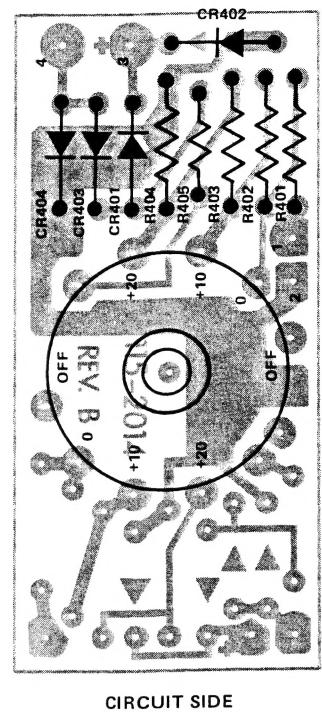
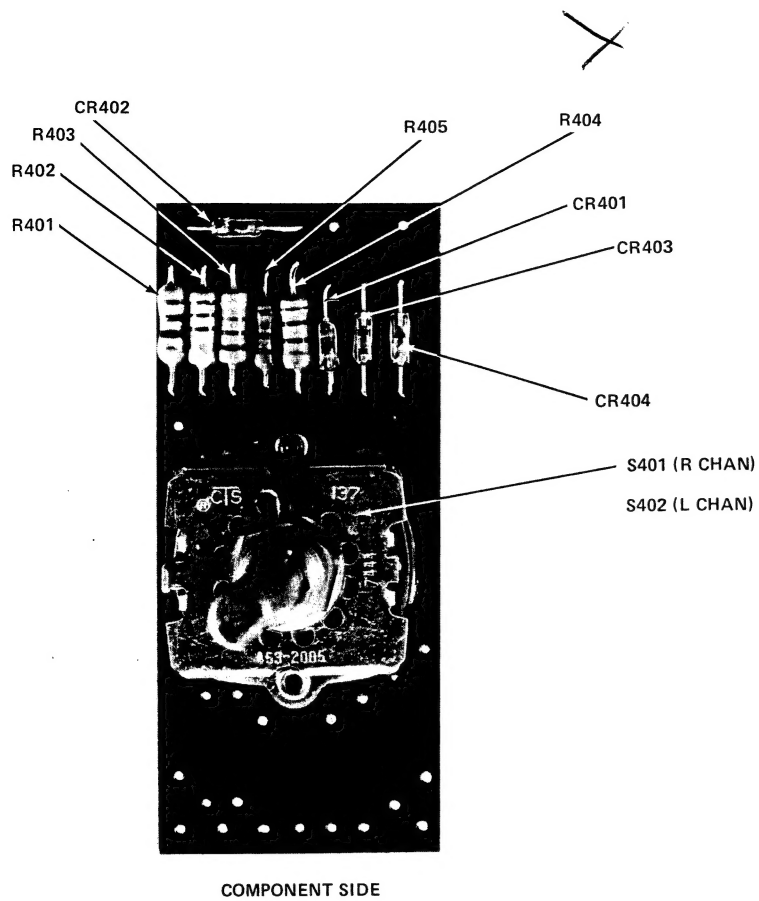


Figure 16. Rectifier Printed Circuit Board Assembly